

GRADIENT CATHODE MATERIAL  
FOR LITHIUM RECHARGEABLE BATTERIES

ABSTRACT OF THE DISCLOSURE

20729423402  
A composition suitable for use as a cathode material of a lithium battery includes  
5 a core material having an empirical formula  $\text{Li}_x\text{M}'_z\text{Ni}_{1-y}\text{M}''_y\text{O}_2$ . "x" is equal to or  
greater than about 0.1 and equal to or less than about 1.3. "y" is greater than about 0.0  
and equal to or less than about 0.5. "z" is greater than about 0.0 and equal to or less  
than about 0.2. M' is at least one member of the group consisting of sodium, potassium,  
nickel, calcium, magnesium and strontium. M'' is at least one member of the group  
10 consisting of cobalt, iron, manganese, chromium, vanadium, titanium, magnesium,  
silicon, boron, aluminum and gallium. A coating on the core has a greater ratio of  
cobalt to nickel than the core. The coating and, optionally, the core can be a material  
having an empirical formula  $\text{Li}_{x1}\text{A}_{x2}\text{Ni}_{1-y1-z1}\text{Co}_{y1}\text{B}_{z1}\text{O}_a$ . "x1" is greater than about 0.1 and  
equal to or less than about 1.3. "x2," "y1" and "z1" each is greater than about 0.0 and  
15 equal to or less than about 0.2. "a" is greater than 1.5 and less than about 2.1. "A" is at  
least one element selected from the group consisting of barium, magnesium, calcium  
and strontium. "B" is at least one element selected from the group consisting of boron,  
aluminum, gallium, manganese, titanium, vanadium and zirconium.